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A SPLINT FOR FRACTURES AND LUXATIONS AT THE ELBOW-JOINT.¹

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INQUIRIES in regard to a splint that I have devised for the treatment of fractures and luxations at the elbow having come to me, in consequence of a reference to it in a paper on "Fractures of the Arm," by Dr. John B. Roberts (*Annals of Surgery*, July, 1892), induce me to publish a description of it.

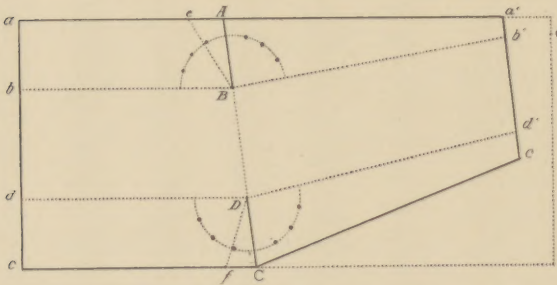
It is well known, and especially since the instructive publications of Dr. Oscar H. Allis on this subject, that one of the chief obstacles to the successful treatment of fracture at the elbow depends upon the difficulty of preserving the normal relation between the principal axes of the arm and forearm. The normal relation of these axes, when the arm is extended, is that of the two lines of an obtuse angle; and to preserve this, a certain number of surgeons have recently advocated and practised the treatment of fractures at the elbow by maintaining the forearm in full extension; for the reason that treatment by means of angular splints is often followed by displacement of one of the condyles of the humerus with loss of the normal abduction (outward, or radial, deviation from the plane of the axis of the humerus) of the forearm.

¹ Read before the Philadelphia Academy of Surgery, December 5, 1892.



Ever since this danger impressed itself sufficiently upon my mind I have been using a splint which has proved quite satisfactory in my hands.

This splint, I make, for each case, from a sheet of light tin or sheet brass. On such a sheet I rule lines, guided by the sound arm, to mark out the relation of the axis of the forearm to that of the upper arm with the whole member extended. I then mark the points of the articular surfaces of the internal and external condyles and draw a straight line across the metal, passing (see figure) through them. With a strong pair of shears I then cut the whole splint out of the metal, and cut from the angles at the inner and outer sides toward the middle line (in the figure, from A to B and from C to D). I then make a few holes with an awl, as shown on the dotted semicircle, and bend the sides ($A a b B$, $C c d B$, $A a' b' B$, $C c' d' D$) backward (as the splint is to be reversed for



the injured arm) so as to form two troughs, and bend these troughs exactly along the line $B D$, so as to make an angular splint. Fixation at the angle required is secured by passing through the holes at the sides an ordinary brass paper-fastener and bending its ends over. The different holes permit of flexion at various angles greater than a right angle, and by cutting away from E to B and from F to D , different degrees of acute angula-

tion may be obtained. Suitable padding with wool (which I prefer to cotton) completes the preparation of the splint, into which the arm is placed, with the forearm in supination, and in which it is confined by means of a bandage.

The splint is light and comfortable, and it permits examination of the joint at any time, without danger of displacement of the fragments, by simply removing the enclosing bandage. In describing it, I do not think it necessary to speak of the means for reducing or preventing traumatic swelling, which are guided by the principles so admirably taught by the late Mr. Sampson Gamgee.

The idea of the splint is to take a piece of light metal and convert it into a trough, the shape of which shall conform to the lines of the arm in extension; then to flex this trough along a line which corresponds with the true plane of the elbow-joint.

An examination of such a splint will show that it conforms to the proper lines of the arm and forearm in extension, and that on flexion the lower trough follows very closely the line of movement of the forearm as it approaches the humerus. At the same time it will be seen that the point at the angle in which the upper end of the ulna rests in flexion is lower than that in which the upper end of the radius rests, as should be the case, to conform the normal anatomic relation of these parts and the normal relation of the internal condyle of the humerus to the external condyle. The ulna being at the elbow-joint a thicker bone than the radius, it is well to have the wool cushion on the radial side a trifle thicker than on the ulnar side; but in many cases of fracture the first swelling compels one to adapt the cushioning rather to the condition of the soft parts than to the absolute size of the bones and the position of their surfaces.

A splint of this sort can only approximately imitate the conditions of the elbow-joint; but I think it does imitate them in a way conducive to good results in the

treatment of fractures. So far as my experience goes, the results have justified my expectations.

Of course, I do not imagine that any one form of splint will prove suitable to every case; but this splint is light, clean, comfortable, and easy to apply, while permitting frequent examinations without risk to the position of the fragments, and changes of the degree of flexion as often as may be necessary, in each maintaining the normal relation of the axes of the arm and forearm.

A study of the elbow-joint, with a view to securing the proper position of the parts after fracture, has led me to believe that good results may be obtained by flexing the forearm quite fully upon the humerus, in which position both ulna and radius act as natural splints to the condyles. On writing this to Dr. H. L. Smith, of Boston, with whom I have had some correspondence on this subject, he tells me that he has already experimented on the cadaver in this direction, with the result of showing that, by this method (the forearm being semi-pronated), the condyles were fixed in a correct position. He has also treated some cases of accidental fracture in the same way, with good results.

If this experience should be repeated and confirmed by others, the splint for elbow-joint fracture would probably be a simple V-shaped one, placed against the outer side of the arm and the back of the forearm. With such a splint I am now treating an inter-condyloid fracture of the humerus. The patient is entirely comfortable; the bones appear to be in correct position, and I hope for a good result.